

**STATUS OF THE PIPING PLOVER IN MASSACHUSETTS**  
**1996 SUMMARY**

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## STATUS OF THE PIPING PLOVER IN MASSACHUSETTS - 1996 SUMMARY

Observers reported a total of 454 breeding pairs of Piping Plovers (Charadrius melodus) at 80 sites in Massachusetts in 1996 (Table 1). Breeding pairs are defined as pairs observed with either a nest or unfledged chicks or that exhibit site tenacity and evidence of pair bonding and territoriality. Overall observer effort in 1996, measured as number of sites surveyed and intensity of census effort at each site, was roughly comparable to previous efforts conducted annually since 1986. At least 8 pairs that established territories or nested unsuccessfully were believed to have moved to new sites and renested or at least established new territories between mid-May and mid-June. These pairs were included in counts of pairs at both sites where they occurred, but were tallied only once in regional and state totals for numbers of pairs and numbers of pairs for which fledging data were reported (Table 1).

Although the 1996 total of 454 pairs is the highest count of Piping Plovers recorded in Massachusetts since comprehensive statewide surveys began in 1985, it is an increase of only 13 pairs (3%) over the 1995 count of 441 pairs (Table 2). This is the lowest annual increase since 1989-90. Numbers of pairs increased in 3 regions of the state, declined in 5, and were unchanged in 1 (Table 3).

In addition to estimating total pairs present during the breeding season, cooperators also censused pairs at all occupied sites and 42 historic or potential sites during this year's standardized "index count" period between 1 and 9 June. The intent of the index count is to minimize double-counting of pairs that move between sites, thereby providing an index to population trends that is more precise than the total count. This year's index count was also timed to coincide with the International Piping Plover Census, a coordinated census effort conducted across all of North America. The 1996 index count was 437 pairs, 96% of the total count of 454 pairs and a 6% increase over the 1995 index count of 413 pairs.

Maximum numbers of pairs occurred at Crane Beach (36), South Beach-Chatham (32), Sandy Neck (29), Monomoy National Wildlife Refuge-South Island (19), Parker River National Wildlife Refuge (17), and Little Beach-Barney's Joy (15). Fifteen sites had  $\geq 10$  pairs and accounted for 56% of all pairs.

Overall mean productivity for Massachusetts in 1996 was 1.35 chicks fledged per pair, based on data from 441 of 454 pairs (97%) at 76 of 80 sites (95%) (Table 2). This is the lowest productivity since 1988 and is the fourth year in a row that statewide productivity has declined (Table 2). Only 2 regions

of the state (South Shore and Upper Cape) averaged  $> 1.5$  chicks fledged/pair, while 3 regions (North Shore, Elizabeth Islands, and Nantucket) averaged  $< 1.0$  chick fledged/pair (Table 3). A chick was considered fledged if it survived  $\geq 25$  days or was observed in flight, whichever occurred first.

Cooperators reported data on reproductive success for 543 nest attempts. Nest success was 0.57 (311 of 543 nests hatched  $\geq 1$  egg), hatching success was 0.56 (1,092 of 1,948 eggs hatched) and fledging success was 0.53 (578 of 1,092 chicks survived to fledge).

Abandonment was the most commonly identified cause of nest loss, followed by crow predation, flooding from high tides or heavy rains, and predation by foxes (Table 4). Wire predator exclosures were used to protect 293 of 511 nests (57%). Fifteen percent of nests in exclosures were abandoned (44 of 293 nests) compared to 6% of nests without exclosures (14 of 218). Causes of abandonment were unknown in 37 of 58 (64%) instances (Table 5). The most commonly identified cause of nest abandonment was harassment by foxes ( $n=9$  nests). Nest success (percentage of nests hatching  $\geq 1$  egg) was 70% for nests within exclosures compared to 49% for nests without exclosures (Table 6). Similarly, 65% of eggs protected with exclosures hatched compared to 51% of unprotected eggs (Table 7).

As usual, causes of chick mortality were more difficult to determine. Two unfledged chicks were known to have been run over by off-road vehicles, one at Plymouth Beach and one at Nauset Beach-Orleans. At Coast Guard Beach in Eastham, where only 6 of 32 chicks fledged (19%), crows were observed harassing chicks and attempting to carry them away. Crows and gulls were suspected but unconfirmed as chick predators at Great Point on Nantucket. Black-crowned Night-Herons were suspected but unconfirmed as chick predators on Chappaquiddick Island, at Quansoo on Martha's Vineyard, and at Hummock Pond on Nantucket. Chicks were reported lost at Black Point Pond on Martha's Vineyard, Great Point on Nantucket, and Horseneck Beach after a period of inclement weather associated with Hurricane Bertha. Fox predation on chicks was suspected but not confirmed at Little Beach in South Dartmouth. Three adult Piping Plovers were found depredated, two by unidentified mammalian and avian predators, respectively, and one by a suspected Great-horned Owl.

We extend our sincere thanks to all the biologists, beach managers, landowners, and volunteers that participated in conservation efforts for Piping Plovers and other coastal birds in Massachusetts in 1996.

*M*  
~~1996~~ = 1997 #s

Table 1. Abundance, distribution, and productivity of Piping Plovers in Massachusetts, 1996.

Location	Number of pairs		No. chicks fledged <sup>c</sup>	No. pairs for which fledge data reported	Source <sup>d</sup>
	Index count <sup>a</sup>	Total count <sup>b</sup>			
<b>NORTH SHORE</b>					
59 Salisbury Beach, Salisbury	0	nd <sup>c</sup>	- 3	-	DR
60 Plum Island-North End, Newburyport/Newbury	1	1	0 0	1	GN
61 Parker River NWR, Newbury/Rowley	17 17	17 <sup>f</sup> 17	20 20	17 <sup>f</sup> 17	GN
62 Sandy Point State Res., Ipswich	2	2	2 0	2	GN
63 Crane Beach, Ipswich	33 24	36 <sup>f</sup> 27	30 (59)	36 <sup>f</sup> 27	DR
64 Coffin's Beach, Gloucester	nd	nd	nd	-	-
65 Wingaersheek Beach, Gloucester	0	nd	nd 4	7	DR
66 Good Harbor Beach, Gloucester	0	nd	nd	-	DR
<b>SOUTH SHORE</b>					
67 Third Cliff, Scituate	0	0	-	-	SH, CW
68 Fourth Cliff, Scituate	1	1	0	1	CW, SH
69 Duxbury Beach, Duxbury/Plymouth	10	10	29	10	CW
70 Plymouth Beach, Plymouth	6	7	9	7	JC, MZ
71 Ellisville State Park, Plymouth	1	1	0	1	MZ
72 Sagamore Beach, Sagamore and Sandwich	5	5	10	5	MZ
73 Scusset Beach State Res., Sandwich	2	2	5	2	MZ
<b>UPPER CAPE</b>					
74 Black Beach/Sippewisset, W. Falmouth	0	0	-	-	SM
75 Woodneck Beach, W. Falmouth	0	0	-	-	SM
76 Washburn Island, Falmouth	1	1	3	1	KB, KM
77 South Cape Beach, Mashpee	3	3	9	3	KB
78 Popponesset Spit, Mashpee	3	3	6	3	BL, KW
79 New Seabury, Mashpee	1	1	5 <sup>s</sup>	1	KB
7 Town Neck Beach, Sandwich	1	1	4	1	LG

Table 1. Continued.

Location	<u>Number of pairs</u>		No. chicks fledged	No. pairs for which fledge data reported	Source
	Index count	Total count			
Springhill Beach, Sandwich	5	6	15	6	LG, HB
East Sandwich Beach, Sandwich	0	0	-	-	ES
Scorton Creek, Sandwich	3	3	8	3	ES, MG
Sandy Neck, Barnstable	28	29	74	29	ES, MG
Sampson's Is.-Dead Neck, Barnstable	2	2	1	2	LG, BL, SH, KW
Dowse's Beach, Osterville	0	nd	-	-	HB
Long Beach, Centerville	2	2	6	2	LG, SH
Squaw Island, Hyannisport	2	2	2	2	LG, SH
Kalmus Park Beach, Hyannis	1	1	2	1	LG, SH
Gray's Beach, Yarmouth	2	3	nd	nd	LG, HB, LGW
Seagull Beach/Radio City, Yarmouth	3	3 <sup>h</sup>	8	3 <sup>h</sup>	LG, SH
Great Island, Yarmouth	5	6 <sup>h</sup>	12	6 <sup>h</sup>	LG, TT, CS
West Dennis Beach, Dennis	1	1	4	1	LG, SMO
Chapin Beach, Dennis	2	2	3	2	LG, LGW
Mayflower Beach, Dennis	0	nd <sup>i</sup>	nd	-	HB, LG, LGW
Town Landings, Dennis	0	nd	nd	-	LG, LGW
Corporation Beach, Dennis	0	nd	nd	-	LG, LGW
Sesuit Beach, Dennis	0	nd	nd	-	LG, LGW
Quivett Neck/Coles Pond, Dennis	0	nd	-	-	HB
Wings Island, Brewster	nd	nd	nd	-	-
Robbins Hill Beach, Brewster	0	nd	nd	-	HB
Town Beach, Brewster	0	nd	nd	-	HB, CS
Ellis Launching Beach, Brewster	0	nd	nd	-	HB, CS
<b>LOWER CAPE</b>					
Forest Beach, Chatham	0	nd	nd	-	HB, CS
Cockle Cove, Chatham	0	nd	nd	-	HB, CS
Harding Beach, Chatham	1	1	0	1	HB
Harding Beach Point, Chatham	0	nd	nd	-	JR

Table 1. Continued.

Location	Number of pairs		No. chicks fledged	No. pairs for which fledge data reported	Source
	Index count	Total count			
08 North Monomoy Island, Chatham	1	1	0	1	JM, SW
09 South Monomoy Island, Chatham	16	19	42	19	JM, SW
10 South Beach, Chatham <sup>1</sup>	29	32	43	32	JR, CS
11 Tern Island, Chatham	3	3	3	2	LG, SM
12 Nauset Beach, Chatham	6	6	2	6	BK, DG
13 Nauset Beach, Orleans	6	6	6	6	BK, DG
14 Nauset Spit (Heights), Orleans	13	14	21	14	BK, DG
15 New Island, Orleans	0	0	0	-	HB
16 Skaket Beach, Orleans	nd	nd	nd	-	-
17 Rock Harbor Beach, Orleans	0	nd	nd	-	HB, CS
17 Rock Creek (north side), Orleans	0	nd	nd	-	HB, CS
19 Plover Spit (Island), Orleans/Eastham <sup>k</sup>	7	7	5	7	NK
20 First Encounter Beach, Eastham	0	nd	nd	-	HB, CS
21 Coast Guard Beach, Eastham	8	9	6	9	NK, EH
21 Marconi Beach, Wellfleet <sup>1</sup>	12	12 <sup>m</sup>	7	12 <sup>m</sup>	NK, EH
22 Indian Neck, Wellfleet	0	nd	nd	-	HB, CS
24 Jeremy Point/Great Island, Wellfleet	9	9	8	9	NK, EH
25 Pamet Harbor-South, Truro <sup>n</sup>	0	nd	nd	-	HB, CS
26 Pamet Harbor-North/ Corn Hill Beach, Truro	1	1	2	1	CS
27 Pond Village Beach, Truro	nd	nd	nd	-	-
28 Pilgrim Beach/Beach Point, Truro	2	2	3	2	CS
29 Ballston Beach/Newcomb Hollow, Truro	3	3	8	3	EH
30 Longnook Beach, Truro	1	1	1	1	EH
31 High Head/Head of the Meadow, Truro	5	5	13	5	EH
32 Race Point-South Beach, Provincetown/Truro <sup>o</sup>	14	14	20	14	EH
33 Race Point-North Beach, Provincetown	10	10	0	10	EH

Table 1. Continued.

Location	Number of pairs		No. chicks fledged	No. pairs for which fledge data reported	Source
	Index count	Total count			
24 Long Point/Wood End, Provincetown	8	8	0	8	EH
<b>BRISTOL COUNTY</b>					
32 Stony Point Dike, Wareham	0	0	-	-	ES
30 Long Beach Point, Wareham	nd	nd	nd	-	-
3 Little Harbor Beach, Wareham	nd	nd	nd	-	-
24 West Island, Fairhaven	2	2	8	2	JHi, RH, RG
30 Winsegansett Heights, Fairhaven	0	0	-	-	JHi, RH, RG
10 Round Hill Beach, Dartmouth	0	0	-	-	JHi, RH, RG
1 Salter's Pond, Dartmouth	1	1	2	1	JHi, RH, RG
22 Demarest-Lloyd State Park, Dartmouth	0	1 <sup>p</sup>	0	1 <sup>p</sup>	JHi, RH, RG
73 Little Beach/Barney's Joy, Dartmouth	15	15 <sup>p</sup>	14	15 <sup>p</sup>	JHi, RH, RG
41 Gooseberry Neck, Westport	0	1 <sup>q</sup>	0	1 <sup>q</sup>	JHi, RH, RG
28 Horseneck Beach, Westport	11	11	18	11	JHi, RH, RG
12 Acoaxet, Westport	0	0	-	-	JHi, RH, RG
16 Cockeast Pond, Westport	1	1	0	1	JHi, RH, RG, GV
47 Richmond Pond, Westport	1	1	0	1	JHi, RH, RG, GV
242 Bay Point, Swansea	0	0	-	-	AW
<b>ELIZABETH ISLANDS</b>					
70 Naushon Island <sup>r</sup>	0	0	-	-	JHa
1 Pasque Island	2 <sup>s</sup>	2 <sup>s</sup>	nd	nd	JHa
56 Nashawena Island	4	5	2	5	MM, DF, JHa
753 Cuttyhunk Island	2	2	4	2	SM, JHi
<b>MARTHA'S VINEYARD</b>					
24 Harthaven, Oak Bluffs	1	1	3	1	DS

Table 1. Continued.

Location	<u>Number of pairs</u>		No. chicks fledged	No. pairs for which fledge data reported	Source
	Index count	Total count			
855 Sylvia State Beach, Edgartown	1	1	1	1	DS, KA, RC
86 Cow Bay, Edgartown	0	nd	nd	-	DS
89 Eel Pond/Little Beach, Edgartown	2	1	3	1	DS
88 Chappaquiddick Beach, Chappaquiddick	1	1	2	1	DS
59 Cape Pogue Elbow/The Narrows, Chappaquiddick	10	11 <sup>w</sup>	9	11 <sup>w</sup>	MM, DF
60 Arruda's Pt./The Jetties, Chappaquiddick	3 <sup>u</sup>	3 <sup>u</sup>	0	3 <sup>u</sup>	MM, DF
61 Leland/East Beaches, Chappaquiddick	4 <sup>v</sup>	4 <sup>v</sup>	6	4 <sup>v</sup>	MM, DF
62 Wasque, Chappaquiddick	1 <sup>w</sup>	1 <sup>w</sup>	0	1 <sup>w</sup>	MM, DF
63 Norton Point Beach, Edgartown	11 <sup>w</sup>	11 <sup>w</sup>	10	11 <sup>w</sup>	RC, KA
64 South Beach, Edgartown	0	nd	nd	-	HD
65 Edgartown Great Pond, Edgartown	4	3	4	3	HD
66 Oyster and Watcha Ponds, Edgartown and W. Tisbury	0	nd	nd	-	LT
67 Tisbury Great Pond/Black Point Pond, Chilmark <sup>x</sup>	8	10 <sup>y</sup>	8	10 <sup>y</sup>	LT, DF, MM
68 Chilmark Pond, Chilmark <sup>z</sup>	3	3	6	3	RR, LT
69 Long Beach/Squibnocket Beach, Chilmark	2	2	5	2	RR, LT
70 Moshup Trail Beach, Gay Head	1	1	3	1	RR, LT
71 Dogfish Bar, Gay Head	5	5	3	5	RR, LT
72 Lobsterville Beach, Gay Head	1	1	1	1	RR, LT
73 Cedar Tree Neck/Lambert's Cove, West Tisbury	0	0	-	-	RJ
74 Tashmoo, West Tisbury	2	2	2	2	RR, LT
875 Wilfred's Pd. and Mink Meadows Beach, Vineyard Haven	0	nd	nd	-	DS, RJ
876 Nomans Land	nd	nd	-	-	-



Table 1. Continued.

Location	Number of pairs		No. chicks fledged	No. pairs for which fledge data reported	Source
	Index count	Total count			
<b>NANTUCKET</b>					
Great Point/The Galls/ Coskata-West Beach <sup>aa</sup>	12	14	8	14	JJ
Coskata-Inner Trail <sup>bb</sup>	0	0	-	-	JJ
Coatue	0	0	-	-	KC
Coskata-East Beach <sup>bb</sup>	0	0	-	-	JJ
Coskata Inlet/The Haulover <sup>bb</sup>	1	1	2	1	KC
Squam Pond	1	1	3	1	KC
Quidnet/Sesachacha Pond	0	nd	nd	-	SM
Low Beach <sup>cc</sup>	5	5	5	5	SP, TSu
Surfside	nd	nd	nd	-	-
Hummock Pond	1	1	0	1	KC
Smith Point	7	8	4	8	TSu, TS
Eel Point	7	7	3	7	KC
Tuckernuck Island	5	5	nd	nd	SM, TS
Muskeget Island	2	2	nd	nd	SM, TS
<b>TOTALS</b>	<u>437</u>	<u>454</u>	<u>597</u>	<u>441</u>	

<sup>a</sup> Index count = number of territorial pairs counted between 1-9 June 1996, the standardized index count period for the Atlantic Coast population.

<sup>b</sup> Total count = total number of territorial pairs present during all or a portion of the 1996 breeding season. Pairs that are suspected of nesting at more than 1 site are only tallied once in regional and state totals and total numbers of pairs for which fledging data were reported.

<sup>c</sup> Chicks fledged are defined as chicks  $\geq 25$  days of age or observed in flight, whichever occurs

Table 1. Continued.

first.

<sup>d</sup> Key to sources: AW = Anthony Waring, BK = Brandon Kibbe, BL = Brian Long, CS = Christine Sousa, CW = Candace Williams, DF = David Fairfax, DG = Deborah Galasso, DR = David Rimmer, DS = Debra Swanson, EH = Ed Hoopes, ES = Eric Strauss, GN = Glynnis Nakai, GV = Griff Venator, HB = Henry Barbour, HD = Helen DeGennaro, JC = John Crane, JHa = Jeremy Hatch, JHi = John Hill, JJ = Jonathan Jendrzewski, JM = Jennifer Megyesi, JR = Jeff Romaneo, KA = Karen Ambrose, KB = Kimberly Bryan, KC = Karen Combs-Beattie, KM = Karl Meyers, KW = Katie Wessling, LG = Laura Gill, LGW = Laney Garner-Warner, LT = Leah Tofte, MG = Melinda Gutman, MM = Mary Merges, MZ = Margo Zdravkovic, NK = Nora Kenneway, RC = Robert Culbert, RG = Randy Groves, RH = Ruth Hefty, RJ = Richard Johnson, RR = Ruth Richards, SH = Scott Hecker, SM = Scott Melvin, SMO = Samantha Morrow, SP = Swede Plaut, SW = Sharon Ware, TS = Tori Samuel, TSu = Tracy Sundell, TT = Tara Torcoletti.

<sup>e</sup> nd = no data available.

<sup>f</sup> Assume that at least 1 pair that nested at Parker River NWR (pair #1, nest #1a, failed on 31 May 1996 and was last observed at Parker River on 4 June) was one of the pairs that was first detected at Crane Beach on 12 or 13 June. Tally this pair in total counts for both sites, but only once in regional and state totals for number of pairs and pairs for which fledging data were reported.

<sup>g</sup> Observations reported by Kimberly Bryan indicated the pair at New Seabury nested successfully twice and raised 2 broods to fledging (2 and 3 chicks, respectively).

<sup>h</sup> We suspect that pair no. 3 that was present at Seagull Beach\Radio City but did not nest, subsequently moved to Great Island. This pair is tallied in total counts for both sites, but only once in regional and state totals for number of pairs and number of pairs for which fledging data were reported.

<sup>i</sup> Henry Barbour observed 2 agitated adults on Mayflower Beach once in mid-May; no birds were observed during the index count period; a single bird was seen several times in late June and first week of July, always feeding. Not enough evidence to record a pair present. Nesting may have been discouraged (or destroyed?) by regular beach sweeping.

<sup>j</sup> Formerly South Beach Island, now reconnected to the mainland near Chatham Light.

Table 1. Continued.

<sup>k</sup> Plover Spit was formerly Plover Island, which in turn was formerly the north end of Nauset Spit; it was created when Nauset Spit breached during winter 1993. During the 1995 nesting season it became increasingly accessible by foot from Coast Guard Beach at low tide, and was easily accessible in 1996.

<sup>l</sup> Includes LeCount Hollow.

<sup>m</sup> Assume that pair no. 6 that lost its nest at Marconi Beach on 24 May subsequently re-nested and was tallied at another site on the Lower Cape. Tally this pair in index and total counts for Marconi Beach, but not in regional or statewide totals for numbers of pairs and pairs for which fledging data were reported.

<sup>n</sup> Pamet Harbor-South is the beach at the south entrance to Pamet Harbor.

<sup>o</sup> Race Point-South Beach includes all the Atlantic Ocean-facing beaches of Cape Cod National Seashore from High Head north to the beginning of Race Point Beach proper, including locations referenced in previous years as Mission Bell, Frenchie's, Exit 9, and Armstrong Cut.

<sup>p</sup> We suspect that one of the non-nesting pairs present at Little Beach/Barney's Joy between 18 May and 4 June subsequently moved to Demarest-Lloyd State Park, where a pair with a 1-egg clutch was found on 16 June. Plovers had not been detected at Demarest-Lloyd on previous surveys on 18 and 26 May and 9 and 10 June. Tally this pair in total counts for both sites, but only once in regional and statewide totals for numbers of pairs and pairs for which fledging data were reported.

<sup>q</sup> The pair at Gooseberry Neck was last seen on 15 May. Assume it moved to another Bristol County site and nested. Timing was such that it could have been pair 8 or 9 at Little Beach, or pair 8, 9, 10, 11, or 12 at Horseneck Beach. Tally this pair in total count and number of pairs for which fledging data were reported for Gooseberry Neck, but not in regional or statewide totals for numbers of pairs and pairs for which fledging data were reported.

<sup>r</sup> Included surveys of beaches on Nonamesset, Uncatena, and Weepecket Islands.

<sup>s</sup> Pasque Island was visited only once, on 15 June. In addition to 2 pairs, 2 single birds were also reported.

Table 1. Continued.

<sup>i</sup> Total count for Cape Pogue Elbow/The Narrows includes 2 non-nesting territorial pairs that were present until 18 and 22 May, respectively. We suspect that one of these pairs eventually nested elsewhere at Cape Pogue as nest no. 13 (2-egg nest found on 31 May). This site also included pairs with nests numbered 2, 3, 4, 5, 8, 9, 10, 11a, 11b, and 13, as reported on forms submitted by The Trustees of Reservations.

<sup>u</sup> Total count for Arruda's Point/The Jetties includes 1 non-nesting pair observed from 25 May to 15 June. Assume either this pair or pair with nest no. 15 on East Beach near Dyke Bridge (found with 4-egg clutch on 12 June) was one of the non-nesting pairs that left Cape Pogue Elbow/The Narrows before the index count. Tally this pair in total count for Cape Pogue Elbow/The Narrows and index and total counts for Arruda's Point/The Jetties, but only once in regional and state totals for numbers of pairs and numbers of pairs with fledging data. This site also included pairs with nests numbered 1a, 1b, and 12 on census forms submitted by the Trustees of Reservations.

<sup>v</sup> Includes pairs with nests numbered 6, 7a, 7b, 14, and 15 on reporting forms submitted by The Trustees of Reservations.

<sup>w</sup> A non-nesting pair was seen from 30 April to 16 May at Wasque Point and from 25 May to 1 June at the overwash west of Wasque Point. One set of tracks was seen between Norton Point and the overwash west of Wasque on 7 June. We suspect this was 1 of 2 pairs that were reported from the east end of Norton Point for both the index and total counts. Tally this pair in index and total counts for both sites, but only once in regional and state totals for number of pairs and number of pairs for which fledging data were reported.

<sup>x</sup> Also includes Quansoo, the Lewis property, and Long Point Wildlife Refuge.

<sup>y</sup> We suspect that 1 non-nesting pair on the Lewis property eventually moved to Quansoo and nested. One of 5 pairs at Black Point Pond apparently did not nest; they were present from at least 6 June to 28 June, during which time they scraped and courted but no nest was found.

<sup>z</sup> Includes Lucy Vincent Beach.

<sup>aa</sup> Census data for Great Point, The Galls, and Coskata-West Beach were not reported separately in 1996. Coskata-West Beach refers to the beach along the Nantucket Sound side of Coskata, from the

Table 1. Continued.

south end of The Galls south and west to the boundary of Coatue. This is the same area that was referenced as Coskata-North Beach by Tina Whitman in 1993 and was included as part of The Galls by Marcia Litchfield in 1991 and 1992.

<sup>bb</sup> Coskata-Inner Trail refers to the inland trail running south and west from Coskata toward Coatue. Coskata-East Beach refers to the beach along the eastern (Atlantic) side of Coskata, including the washover at The Glades. Coskata Inlet is the inlet from Nantucket Harbor into Coskata Pond.

<sup>cc</sup> Low Beach includes entire beach from Siasconset south and west to abandoned Navy base southwest of Tom Nevers Head.

Table 2. Summary of abundance and productivity of Piping Plovers in Massachusetts, 1986-1996.

Year	Index count <sup>a</sup>	Total count <sup>b</sup>	Mean chicks fledged/pair	No. (% of total) pairs with fledge data
1996	437	454	1.35	441 (97)
1995	413	441	1.62	426 (97)
1994	329	352	1.80	334 (95)
1993	258	289	1.92	264 (91)
1992	207	213	2.03	206 (97)
1991	148	160	1.72	156 (98)
1990	111	140	1.38	125 (89)
1989	-	137	1.59	123 (90)
1988	-	134	1.29	114 (85)
1987	-	126	1.07	89 (71)
1986	-	139	-	-
1985	-	131	-	-

<sup>a</sup> Index count = total territorial pairs counted during 9-day standardized count period in late May and/or early June.

<sup>b</sup> Total count = total number of territorial pairs present during all or a portion of the breeding season.

Table 3. Summary of Piping Plover abundance (total pairs) and productivity (mean number of chicks fledged per pair) by region of Massachusetts, 1995 and 1996.

Region	Total pairs		Mean chicks fledged/pair	
	1995	1996	1995	1996
North Shore	48	55	2.35	0.96
South Shore	17	26	1.88	2.04
Upper Cape	69	68	1.84	2.49
Lower Cape	165	162	1.45	1.18
Buzzards Bay	33	31	1.73	1.35
Elizabeth Islands	16	9	0.57	0.86
Martha's Vineyard	59	59	1.43	1.12
Nantucket	25	37	1.08	0.68
Tuckernuck, Muskeget Is.	9	7	1.40	nd <sup>a</sup>
Total	441	454	1.62	1.35

<sup>a</sup> nd = no data available

Table 4. Causes of Piping Plover nest failures in Massachusetts, 1996.

Cause of nest failure	Number of nests		Total
	With exclosure	Without exclosure	
Abandonment	44	14	58
Crow	16	17	33
Overwash/flooding	9	23	32
Fox	9	19	28
Unknown predator	4	20	24
Gull	4	9	13
Skunk	0	4	4
Coyote	0	2	2
Eggs failed to hatch	1	0	1
Vandalism	1	0	1
Vehicle	0	1	1
Other	1 <sup>a</sup>	0	1
Unknown	9	25 <sup>b</sup>	34
Total	98	134	232

<sup>a</sup> At a nest on Cape Pogue, 1 adult had been depredated and the eggs were missing. Evidence at the site suggested an avian predator.

<sup>b</sup> Of 11 unexclosed nests lost to unknown causes at South Beach-Chatham, several were suspected to have been depredated by a Northern Harrier.



Table 5. Suspected causes of Piping Plover nest abandonments in Massachusetts, 1996.

Cause of nest abandonment	Number of nests		Total
	With exclosure	Without exclosure	
Unknown	25 <sup>a</sup>	11	36
Fox harassment	9	0	9
Disturbance by humans or dogs	4	0	4
Wind-blown sand from Hurricane Bertha	0	3	3
Adult depredated	2	0	2
Adults rejected exclosure	1	0	1
Eggs inviable	1	0	1
Other	2 <sup>b</sup>	0	2
Total	44	14	58

<sup>a</sup> Includes 4 nests at Crane Beach where abandonment may have been related to windy conditions.

<sup>b</sup> One nest may have been abandoned as a result of harassment by foxes or crows, but evidence was inconclusive. One nest was abandoned after rain eroded the sandy hummock on which the nest was situated and an egg rolled out.

Table 6. Effects of predator exclosures on success of Piping Plover nests in Massachusetts, 1996.

Fate of nests	Number of nests (%)	
	With exclosure	Without exclosure
Successful <sup>a</sup>	204 (70)	107 (49)
Unsuccessful <sup>b</sup>	89 (30)	111 (51)
Total <sup>b</sup>	293 (100)	218 (100)

<sup>a</sup> Nests were considered successful if they hatched  $\geq 1$  egg.

<sup>b</sup> Not included are 9 nests with exclosures and 23 nests without exclosures that were lost to tidal overwash or flooding from heavy rains.

Table 7. Effects of predator exclosures on hatching success of Piping Plover eggs in Massachusetts, 1996.

Fate of eggs	Number of eggs (%)	
	With exclosure	Without exclosure
Hatched	731 (65)	361 (51)
Depredated/ failed <sup>a</sup>	400 (35)	353 (49)
Total	1,131 (100)	714 (100)

<sup>a</sup> Not included are 36 eggs from 9 nests with exclosures and 67 eggs from 23 nests without exclosures lost to high tide overwash or flooding from heavy rains.